

IN THE CLAIMS:

Please cancel claims 1-5, and 8-11 without prejudice.

1 1. - 5 (Cancelled)

1 6. (Currently Amended): A computer implemented method for managing data to be
2 written to a file served by a storage system while the file is undergoing a write allocation
3 procedure, the method comprising the steps of:
4 receiving a write operation comprising data to be written to the file;
5 associating the received data with a buffer data control structure associated with
6 the file; and
7 marking the buffer data control structure associated with the file as being dirty for
8 a next consistency point;
9 associating entries in a flags array of the buffer data control structure with a cur-
10 rent consistency point and with a next consistency point; and
11 ~~The computer implemented method of claim 5~~
12 accessing entries associated with a current consistency point
13 ~~wherein entries associated with a current consistency point are accessed~~
14 by indexing into the flags array using a value calculated by performing a logical AND
15 operation on a consistency point counter and a value of 1 .

1 7. (Previously Presented): The computer implemented method of claim 6 wherein the
2 consistency point counter is monotonically increasing value that identifies a current con-
3 sistency point.

1 8. – 11. (Cancelled)

1 12. (Currently Amended): A storage system for using a networked environment capable
2 of accepting write operations directed to files currently undergoing a write allocation pro-
3 cedure, the storage system comprising:

4 means for receiving write operations containing data directed to the file;

5

6 ~~means for associating the received data with a buffer data control structure; and~~

7 ~~means for marking the buffer data control structure as being dirty for a next con-~~
8 ~~sistency point~~

9

10 means for using a consistency point counter to label modified data as belonging to
11 the current consistency point or to the next consistency point; and

12 means for capturing data modified for the current consistency point in the current
13 consistency point and not capturing data belonging to the next consistency point.

1 13. (Currently Amended): The storage system of claim 12 further comprising:

2 ~~wherein means for associating the received data with a buffer data control structure com-~~
3 ~~prises~~

4 means for associating the received data with a buffer data control structure; and

5

6 means for setting a pointer in the buffer data control structure.

1 14. (Currently Amended): The storage system of claim 12 [10] wherein a second
2 pointer in the buffer data control structure points to data already written to the file.

1 15. (Currently Amended): A storage system adapted to enable write operations to a file
2 undergoing write allocation, the storage system comprising:
3 a write allocation process of a file system, the write allocation process adapted to
4 associate received file data with a buffer data control structure upon receipt of a write op-
5 eration directed to the file while the file is undergoing write allocation;
6 a consistency point counter used to label modified data as belonging to the current
7 consistency point or to the next consistency point, and capturing data modified for the
8 current consistency point in the current consistency point and not capturing data belong-
9 ing to the next consistency point.

1 16. (Previously Presented): The storage system of claim 15 wherein the buffer data con-
2 trol structure comprises a flags array having an entry associated with a current consis-
3 tency point and an entry associated with a next consistency point.

1 17. (Original): The storage system of claim 16 wherein the entry associated with the cur-
2 rent consistency point is identified by performing addition modulo addition to a consis-
3 tency point counter.

1 18. (Original): The storage system of claim 16 wherein the entry associated with the next
2 consistency point counter is identified by performing addition modulo two to a consis-
3 tency point counter.

1 19. (Currently Amended): A storage system adapted to enable write operations to a file
2 undergoing write allocation, the storage system comprising:

3 a write allocation process of a file system, the write allocation process adapted to
4 associate received file data with a buffer data control structure upon receipt of a write op-
5 eration directed to the file while the file is undergoing write allocation;
6 a flags array having an entry associated with a current consistency point and an entry as-
7 sociated with a next consistency point, and

8
9 ~~The storage system of claim 16 wherein~~
10 the entry associated with the current consistency point is accessed using an index value
11 calculated by performing a logical AND operation on a consistency point counter and a
12 value of 1.

1 20. (Currently Amended): The storage system of claim 19 [46] wherein the entry asso-
2 ciated with the next consistency point is accessed using an index value calculated by sub-
3 tracting from a value of 1 a result of performing a logical AND operation on a consis-
4 tency point counter and a value of 1.

1 21. (Original): A method for managing data to be written to a file while the file is under-
2 going a write allocation procedure, the method comprising the steps of:

3 determining if the buffer is dirty for a current consistency point;
4 performing, in response to determining that the buffer is dirty for the current consistency
5 point, write allocation of a buffer associated with the file for a current consistency point;
6 and

7 freeing, if the buffer is dirty for a next consistency point, data written during the
8 step of write allocation.

1 22. (Original): The method of claim 21 wherein the step of determining if the buffer is
2 dirty for a current consistency point further comprises the step of examining a flag in a
3 buffer data control structure associated with the buffer.

1 23. (Original): The method of claim 22 wherein the flag is an entry in a flags array stor-
2 ing entries for the next consistency point and the current consistency point.

1 24. (Original): The method of claim 23 wherein the entry for the next consistency point
2 is identified by performing addition modulo two to a consistency point counter.

1 25. (Original): The method of claim 23 wherein the entry for the current consistency
2 point is identified by performing addition modulo two to a consistency point counter.

1 26. (Original): The method of claim 21 further comprising the step of increasing a con-
2 sistency point counter.

1 27. (Currently Amended): A computer implemented buffer data control structure for use
2 in a storage operating system permitting write operations to files undergoing a write allo-
3 cation procedure, the buffer data control structure comprising:

4 a flags array having entries for flags associated with a current consistency point
5 and entries associated with a next consistency point;

6 a first data pointer pointing to file data associated with the current consistency
7 point; and

8 a second data pointer pointing to file data associated with the next consistency
9 point;
10 a consistency point counter used to label modified data as belonging to the current
11 consistency point or to the next consistency point, and capturing data modified for the
12 current consistency point in the current consistency point and not capturing data belong-
13 ing to the next consistency point.

1 28. (Previously Presented): The computer implemented buffer data control structure of
2 claim 27 wherein the flags associated with a current consistency point are identified by
3 performing addition modulo two to a consistency point counter.

1 29. (Previously Presented): The computer implemented buffer data control structure of
2 claim 27 wherein the flags associated with the next consistency point are identified by
3 performing addition modulo two to a consistency point counter.

1 30. (Currently Amended): A computer implemented method for processing a write op-
2 eration to a file, while the file is undergoing a write allocation procedure, without delay-
3 ing the write operation, the method comprising the steps of:
4 receiving the write operation and information associated therewith, the write op-
5 eration directed to the file to be written to during a next consistency point; and
6 differentiating the information associated with the write operation from in-
7 formation currently undergoing write operation to capture data modified for the current
8 consistency point in the current consistency point and not capturing data belonging to the
9 next consistency point.

1 31. (Previously Presented): The computer implemented method of claim 30 wherein the
2 step of differentiating further comprises the step of modifying an inode associated with
3 the file.

1 32. (Previously Presented): The computer implemented method of claim 31 wherein the
2 inode comprises an in core section and an on disk section.

1 33. (Previously Presented): The computer implemented method of claim 31 wherein the
2 step of modifying the inode further comprises the step of modifying a flag in a flag field
3 of the inode.

1 34. (Previously Presented): The computer implemented method of claim 33 wherein the
2 modified flag indicates that the file was modified during a consistency point.

1 35. (Currently Amended): A computer implemented method for processing a write op-
2 eration to a file, while the file is undergoing a write allocation procedure, without delay-
3 ing the write operation, the method comprising the steps of:

4 receiving the write operation and information associated therewith, the write op-
5 eration directed to the file to be written to during a next consistency point;

6 differentiating the information associated with the write operation from in-
7 formation currently undergoing write operation;

8 modifying a flag in a flag field of an inode associated with the file; and
9

10 ~~The computer implemented method of claim 33 wherein the step of modifying the inode~~
11 ~~further comprises the step of~~

12
13 modifying a shadow index associated with the information.

1 36. (Currently Amended): A computer system for processing a write operation to a file,
2 while the file is undergoing a write allocation procedure, without delaying the write op-
3 eration, the system comprising:

4 means for receiving the write operation and information associated therewith, the
5 write operation directed to the file to be written to during a next consistency point; and

6 means for differentiating the information associated with the write operation from
7 information currently undergoing write operation to capture data modified for the current
8 consistency point in the current consistency point and not capture data directed to be writ-
9 ten during the next consistency point .

1 37. (Previously Presented): The computer system of claim 36 wherein means for differ-
2 entiating further comprises means for modifying an inode associated with the file.

1 38. (Previously Presented): The computer system of claim 37 wherein the inode com-
2 prises an in core section and an on disk section.

1 39. (Previously Presented): The computer system of claim 37 wherein means for modi-
2 fying the inode further comprises means for modifying a flag in a flag field of the inode.

3
1 40. (Previously Presented): The computer system of claim 39 wherein means for modi-
2 fying the flag further comprises means for indicating the file was modified during a con-
3 sistency point.

1 41. (Currently Amended): A computer system for processing a write operation to a file,
2 while the file is undergoing a write allocation procedure, without delaying the write op-
3 eration, the system comprising:

4 means for receiving the write operation and information associated therewith, the
5 write operation directed to the file to be written to during a next consistency point; and
6 means for differentiating the information associated with the write operation from
7 information currently undergoing write operation;
8 means for differentiating has means for modifying an inode associated with the
9 file;
10 means for modifying a flag in a flag field of the inode; and
11
12 ~~The computer system of claim 39 wherein means for modifying the inode further com-~~
13 ~~prises~~
14
15 means for modifying a shadow index in the inode with the information.

Please add new claims 42, *et seq.* as follows:

1 42. (New) A computer implemented method for managing data to be written to a file
2 served by a storage system, the method comprising the steps of:
3 having data to be written to the file, the data received from a write operation;
4 labeling data modified in response to the write operation as belonging to the cur-
5 rent consistency point or to the next consistency point; and
6 capturing, in the current consistency point, data belonging to the current consis-
7 tency point and not capturing data belonging to the next consistency point.

1 43. (New) The method of claim 42 further comprising:
2 selecting a time for writing the current consistency point to persistent storage;
3 locating buffer data which has been written to a buffer but which has not been
4 written to persistent storage before the time selected for the current consistency point to
5 be written to persistent storage; and
6 capturing the buffer data into the current consistency point.

1 44. (New) The method of claim 42 further comprising:
2 maintaining a flags array in a buffer data control structure, the flags array having
3 entries associated with a current consistency point and with a next consistency point.

1 45. (New) The method of claim 44 further comprising:
2 using a monotonically increasing consistency point (CP) counter to identify the
3 current CP as the current value of the CP counter, and the next CP as the value of the CP
4 counter plus 1.

1 46. (New) The method of claim 45 further comprising:
2 utilizing modulo-two arithmetic with the CP counter to perform an AND opera-
3 tion using “CP AND 1” to obtain a first value of 0 or 1; and
4 utilizing modulo-two arithmetic with the CP counter to perform an AND opera-
5 tion using “1-(CP AND 1)” to obtain a second value of 0 or 1, to produce flag values al-
6 ternating between values of “0” and “1” to represent current and next consistency points.

1 47. (New) The method of claim 42 further comprising:
2 associating the received data with a buffer data control structure by setting a
3 pointer in the buffer data control structure to a memory location associated with the re-
4 ceived data.

1 48. (New) The method of claim 47 further comprising:
2 marking the buffer data control structure as being dirty for a next consistency
3 point by setting a flag in a flags array of the buffer data control structure.

1 49. (New) The method of claim 42 further comprising:

2 differentiating entries associated with the current consistency point and the next
3 consistency point by performing modulo two addition to a consistency point counter.

1 50. (New) A computer implemented storage system to manage data to be written to a
2 file served by a storage system, the method comprising the steps of:

3 a write operation providing the data to be written to the file;

4 data modified in response to the write operation labeled as belonging to the cur-
5 rent consistency point or to the next consistency point; and

6 an operating system to capture the data belonging to the current consistency point
7 and not capturing the data belonging to the next consistency point.

1 51. (New) The method of claim 50 further comprising:

2 a time for writing the current consistency point to persistent storage;

3 buffer data which has been written to a buffer but which has not been written to
4 persistent storage before the time selected for the current consistency point to be written
5 to persistent storage; and

6 an operating system process to capture the buffer data into the current consistency
7 point.

1 52. (New) The method of claim 50 further comprising:

2 a flags array maintained in a buffer data control structure, the flags array having
3 entries associated with a current consistency point and with a next consistency point.

1 53. (New) The method of claim 52 further comprising:
2 a monotonically increasing consistency point (CP) counter to identify the current
3 CP as the current value of the CP counter, and the next CP as the value of the CP counter
4 plus 1.

1 54. (New) The method of claim 53 further comprising:
2 modulo-two arithmetic utilized with the CP counter to perform an AND operation
3 using “CP AND 1” to obtain a first value of 0 or 1 and, the modulo-two arithmetic with
4 the CP counter to perform an AND operation using “1-(CP AND 1)” to obtain a second
5 value of 0 or 1, to produce flag values alternating between values of “0” and “1” to repre-
6 sent current and next consistency points.

1 55. (New) The method of claim 50 further comprising:
2 a pointer in a buffer data control structure set to a memory location associated
3 with the received data to associate the received data with the buffer data control structure.

1 56. (New) The method of claim 55 further comprising:
2 an operating system to mark the buffer data control structure as being dirty for a
3 next consistency point by setting a flag in a flags array of the buffer data control struc-
4 ture.

1 57. (New) The method of claim 50 further comprising:

2 modulo two arithmetic to differentiate entries associated with the current consis-
3 tency point and the next consistency point by performing modulo two addition to a con-
4 sistency point counter.

1 58. (New) A computer readable media, comprising:

2 said computer readable media containing instructions for execution on a processor
3 for the practice of a method of managing data to be written to a file served by a storage
4 system, the method having the steps of,

5 having data to be written to the file, the data received from a write operation;

6 labeling data modified in response to the write operation as belonging to the cur-
7 rent consistency point or to the next consistency point; and

8 capturing, in the current consistency point, data belonging to the current consis-
9 tency point and not capturing data belonging to the next consistency point.